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FACULTY OF BIOSCIENCE ENGINEERING

Microbial changes in the ileal and caecal digesta of broilers fed lemon peel and orange peel extracts and *Curcuma xanthorrhiza* essential oil, and subjected to chronic heat stress

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Introduction

Heat stress exerts deleterious effects on animal health and can increase growth and virulence factor expression in harmful microbes within the lumen (Bailey *et al.,* 2004). Due to the growing aversion of using antibiotics in animal feed, the potential of natural extracts in animal diets is being researched. Studies have shown that phenolic compounds (PC), found in some phytogenics can act as antimicrobials and can modulate the gut microbial ecosystem (Si *et al.,* 2006). Orange peel extract (OPE), lemon peel extract (LPE) and *Curcuma xanthorrhiza* essential oil (CXEO) are rich in PC (Table 1). Therefore, the potential of these products on intestinal microflora of broiler chickens under heat stress condition was tested.

Table 1. The main bioactive compounds of the investigated plant extracts

Compounds	OPE	LPE	CXEO
Protocatchic (mg/kg)	1054	827	-
Catechol (mg/kg)	84	104	-
Cinnamic (mg/kg)	59	34	-
Zanthorrhizol	-	-	>30%
Ar/B Curcumene	-	-	>30%

Materials & Methods

A total of 336 Ross 308 broilers were randomly allocated to 7 dietary treatments with four replicate pens of 12 chicks each. The basal diet was fed as a control diet or supplemented with either OPE, LPE or CXEO at two different levels (200 and 400 mg/kg). These diets were fed from 25 to 38 days of age. From day 28 of age, the basal temperature (22 °C) was increased daily to 34 °C with 50% relative humidity for 5 hours to induce heat stress (Aksit *et al.,* 2006). At day 38 of age, ileal and caecal contents were collected (4 animals per pen) for microbial counts.

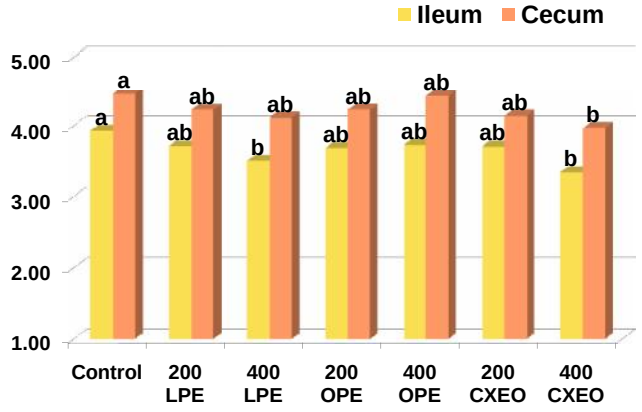
Table 2. Effects of the dietary plant extracts on counts of intestinal lactobacilli and total anaerobes in broilers under heat stress

	Ileum		Caecum	
(log_{10} CFU/g)	Lactobacilli	Total anaerobes	Lactobacilli	Total anaerobes
Control	3.99	5.01	4.62	5.62
OPE (mg/kg)				
200	4.15	5.46	5.16	5.89
400	4.12	5.38	5.14	5.96
LPE (mg/kg)				
200	4.06	5.29	5.15	5.82
400	4.11	5.10	4.92	6.01
CXEO (mg/kg)				
200	4.40	5.47	5.19	5.93
400	4.55	5.50	5.20	6.41

Results & Discussion

The results showed lower counts for coliforms in ileum of chickens fed with 400 mg/kg LPE (3.50 log_{10} CFU/g) or CXEO (3.42 log_{10} CFU/g) diets as compared to control (3.93 log_{10} CFU/g) ($P<0.05$) (Fig 1). In caecal digesta, only for treatment CXEO at 400 mg/kg there was a reduction of coliforms. For both intestinal sections, similar counts of *Lactobacillus* spp. and total anaerobic counts across treatment groups were found ($P>0.05$) (Table 2). Results suggest that plant extracts, in particular CXEO and LPE reduced the number of coliform bacteria in the distal part of the gut.

Fig 1. Effects of the dietary plant extracts on intestinal coliforms in broilers under heat stress



[a-b] Means within intestinal compartments with no common superscript are significantly different ($P<0.05$).

Conclusion

Under the conditions of this study, it can be stated that dietary CXEO and LPE at 400 mg/kg feed could be used in broiler chicken diets during the finisher phase to prevent or diminish the heat stress-induced alteration of the intestinal microbiota.

References

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